



Opportunities for Trading in Missouri

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***MNLRS Meeting
May 12, 2015
Jefferson City, Missouri***

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Missouri Innovative Nutrient Trading Project (2013)

- Evaluate Potential for Implementing a Trading Program in Missouri
- Develop Framework for a Statewide Trading Program (Permitting)
- Conduct Simulated Trading Exercise



Missouri Department
of Natural Resources

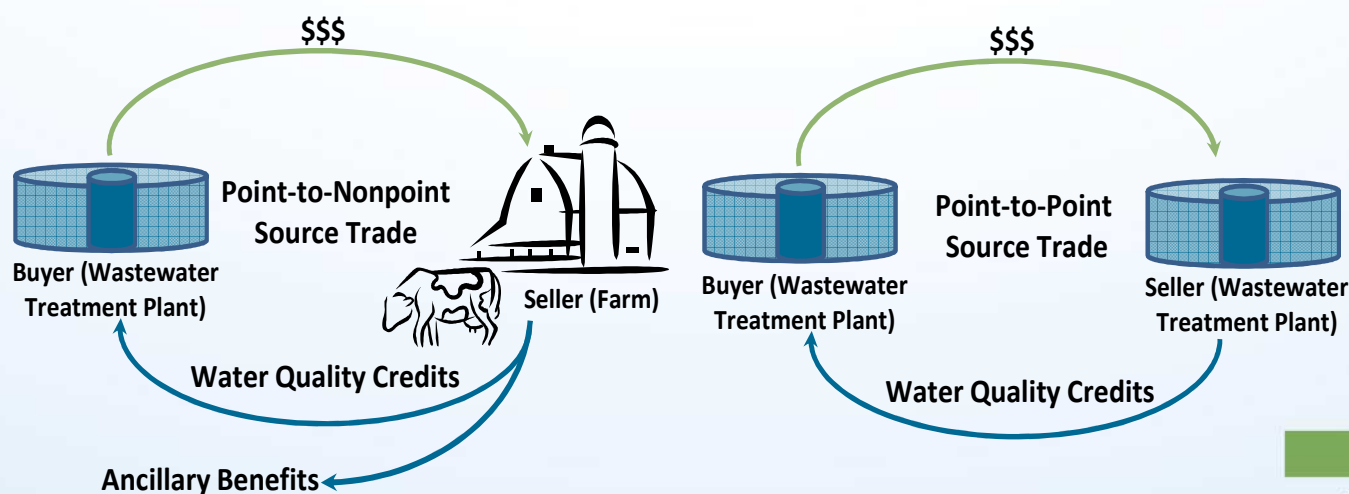


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What is Water Quality Trading?

- Market-Based Compliance System Where One Discharger Buys or Sells Pollution Credits from Another
 - Point-to-Point
 - Point-to-Nonpoint
 - Not Only Nutrients



Cost-Effective Reductions

Control Practice	\$/lb Phosphorus	\$/lb Nitrogen
WWTF Upgrades	5 to 106	6 to 11
MS4 Retrofits	--	≈ 200
Conservation Tillage	≈ 7	≈ 1.50
Ag. Grass Buffer	≈ 20	≈ 1
Animal Waste/Runoff Control	≈ 31	≈ 4
Constructed Wetlands	≈ 2	≈ 2

Sources: Chesapeake Bay, EPA 2007; WERF 2005; WRI 2009



Trading Programs

Procedures,
Frameworks, Rules

Trading Activity

NPDES
Permits



National Trading Progress

Stephenson and Shabman 2011

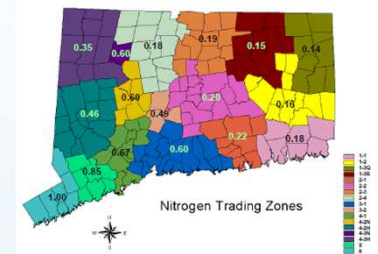
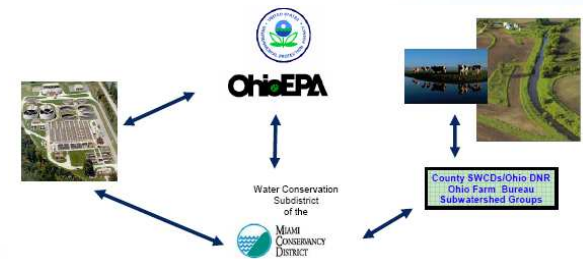
- **Despite More than 10 Years** of State and Federal Agency Promotion, Demonstration Projects, and Research Nutrient Reductions Through **NPS Trading has been Trivial**
- **> 80% of All** Trades are in Long Island Sound
- Great Miami Water Quality Trading Program (“Flagship” Point-Nonpoint) **Has Not Produced a Single Trade**
 - Sustained Through Grants
 - Not Incorporated into NPDES Permits

Critical Program Design Factors

- 1) Trading margin
How Much to Trade?
- 2) Trading area
With Whom to Trade?
- 3) Trading ratio
How Many Extra Credits to Meet the Goal?

 **Rahr Malting Co.**  Shakopee, MN

Site Name	Type of project	Location in Minnesota	CBOD equivalent credits (lbs/day)
Minnesota River	Riparian area natural and woody vegetation establishment	New Ulm	71.8
Fruhwith Farm	Riparian area natural and woody vegetation establishment	New Ulm	28.9
Dean Hathaway	Livestock exclusion and bank stabilization	New Ulm	13.4
Sediment	Bluff stabilization	Henderson	98.7
			212.8 total



The Neuse River Compliance Association and Its Co-Permittee Members

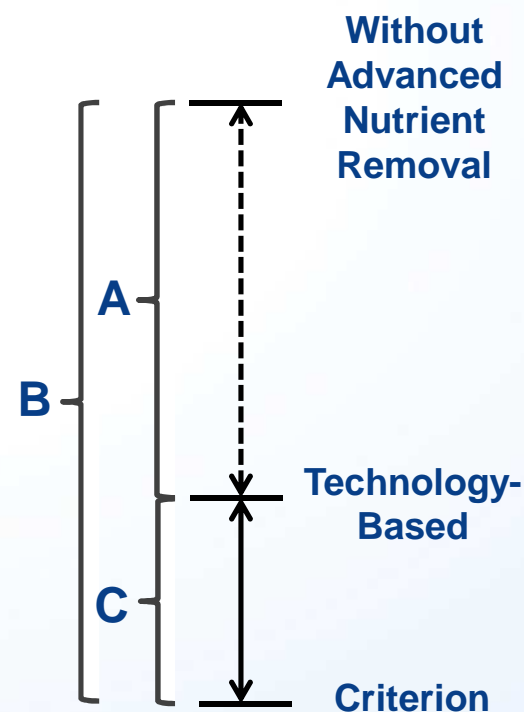
APPENDIX A
CO-PERMITTEES, TRADING FACTORS, AND TN ALLOCATIONS - NEUSE RIVER COMPLIANCE ASSOCIATION

Permittee	Permittee	Facility	Q01	TF	Allocation TN Allocation	Excess TN Allocation
1	MC000001	County of Wayne	1.0	100%	10.000	0.000
2	MC000002	County of Wayne	1.0	100%	10.000	0.000
3	MC000003	County of Wayne	1.0	100%	10.000	0.000
4	MC000004	County of Wayne	1.0	100%	10.000	0.000
5	MC000005	County of Wayne	1.0	100%	10.000	0.000
6	MC000006	County of Wayne	1.0	100%	10.000	0.000
7	MC000007	County of Wayne	1.0	100%	10.000	0.000
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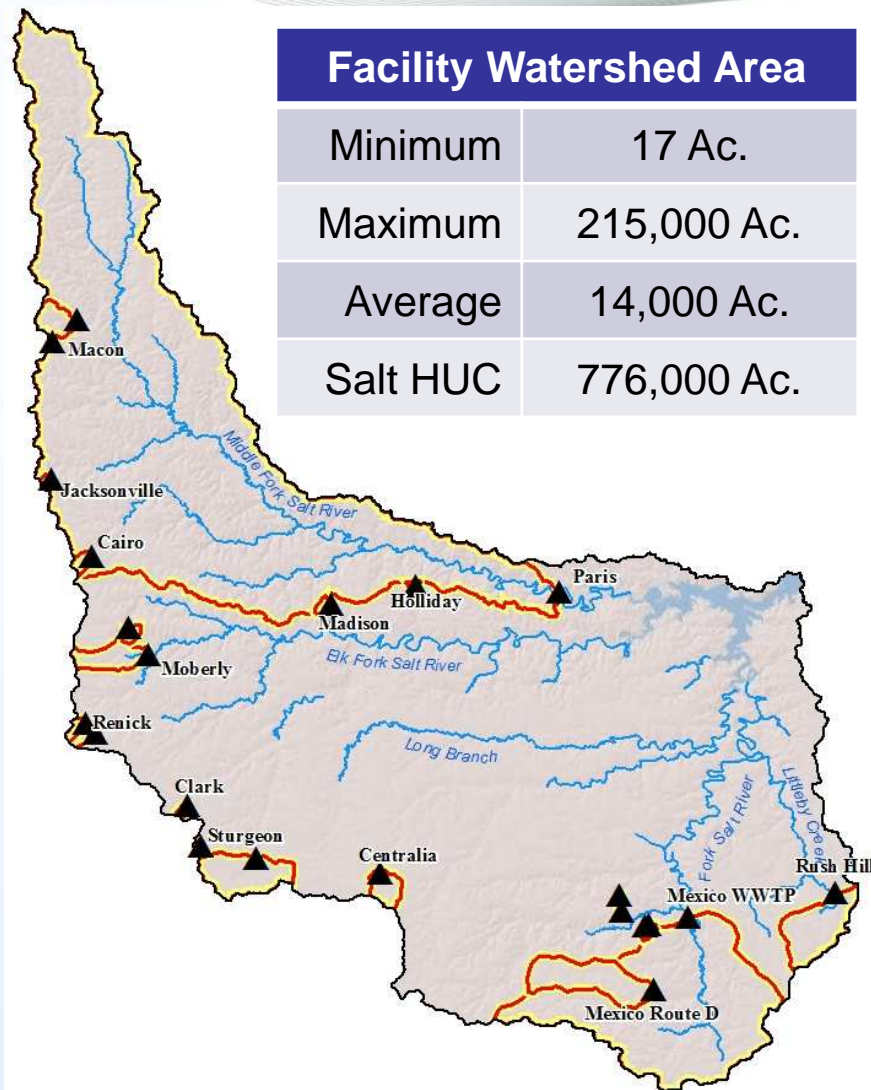
Trading Margin: *How Much to Trade?*

- **Margin**
 - What are we trading from?
 - What are we trading to?
- **3 Potential Margins**
- **Defines Point Source Demand**

Target Category	TP (mg/L)	TN (mg/L)
Without Nutrient Removal	4	20
Technology-Based	1	10
Criterion	0.1	1

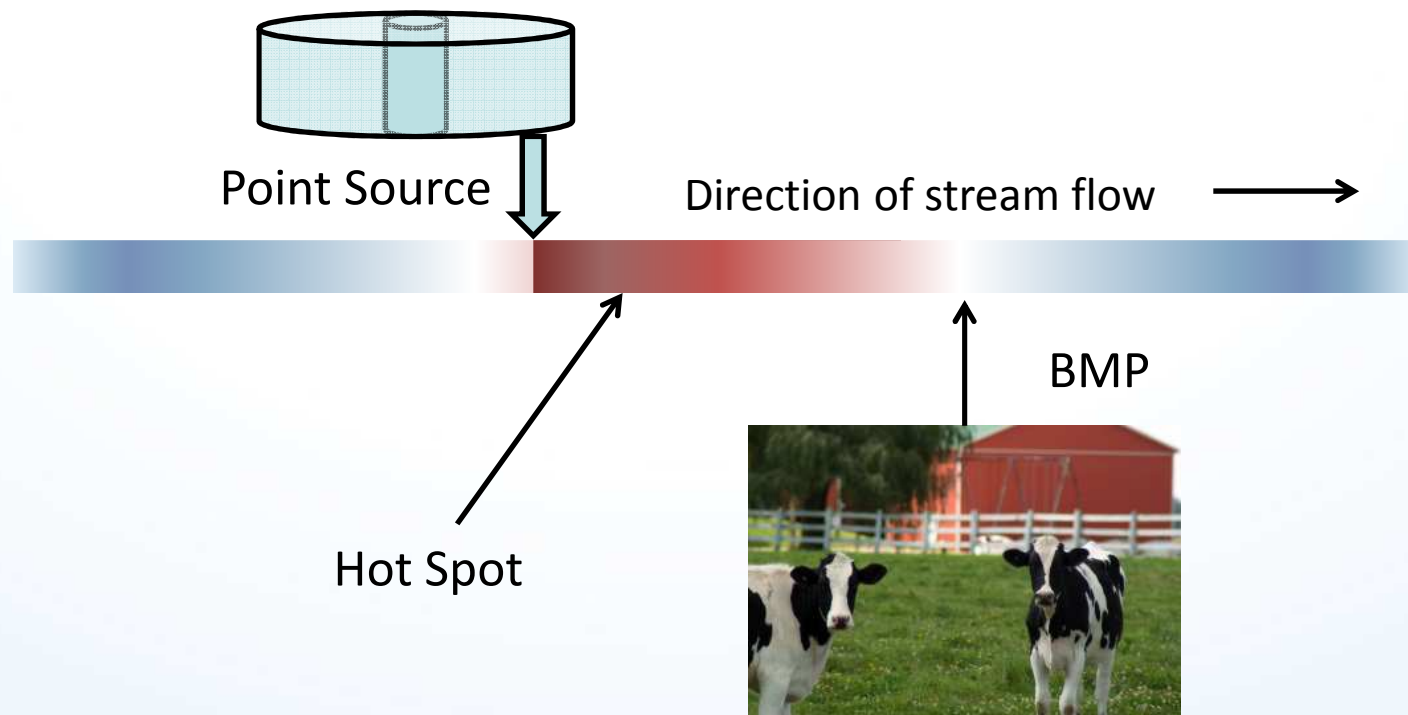


Trading Area: *Where to Trade?*

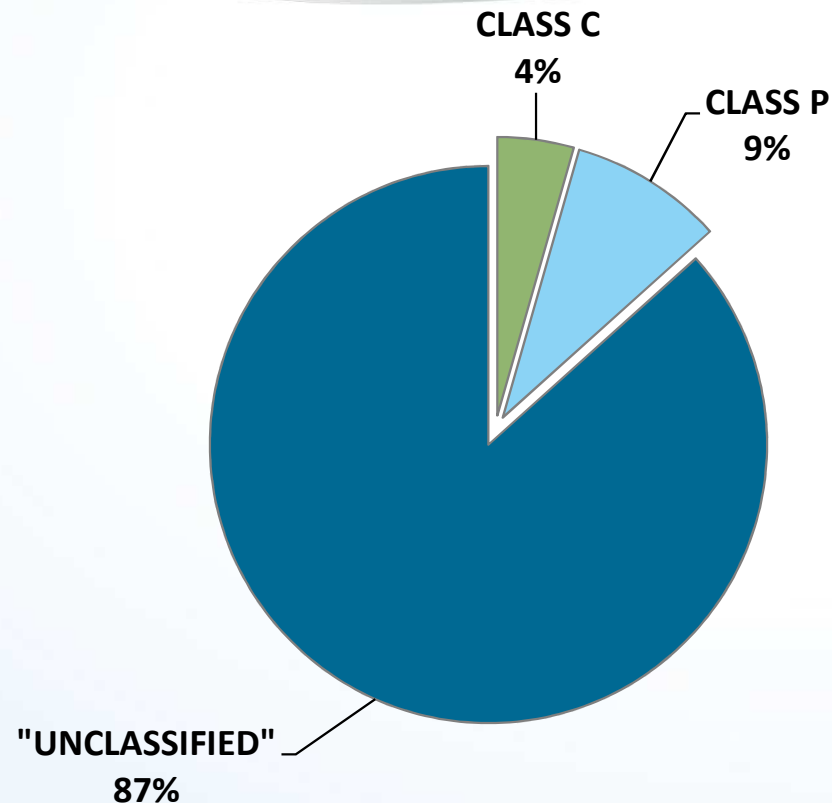


- Watershed-Wide: To Decrease Overall Loadings
- What Happens if We Restrict Trading to Upstream-Only?
 - To reduce hot spots

Hot Spots



Domestic Discharges to Streams and Rivers

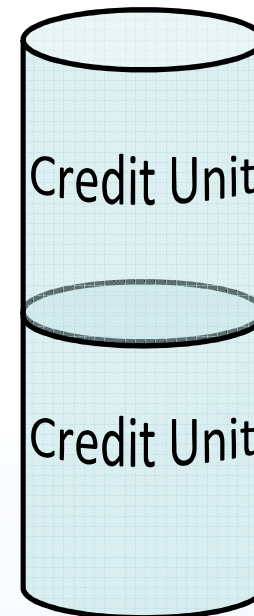


- Approximately 2000 C/U Facilities
 - 97% < 1.0 MGD = Most Incentive to Trade

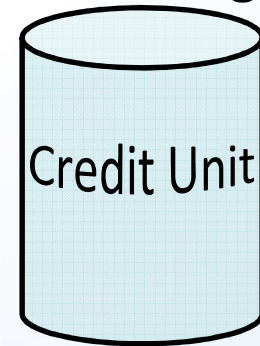
Trading Ratio: *How Many More Credits?*

- **Delivery Ratio**
 - Instream attenuation
- **Equivalency Ratio**
 - Different forms of same pollutant
- **Uncertainty Ratio**
 - Issues in estimating nonpoint loadings
- **Retirement Ratio**
 - Net improvements

Purchased



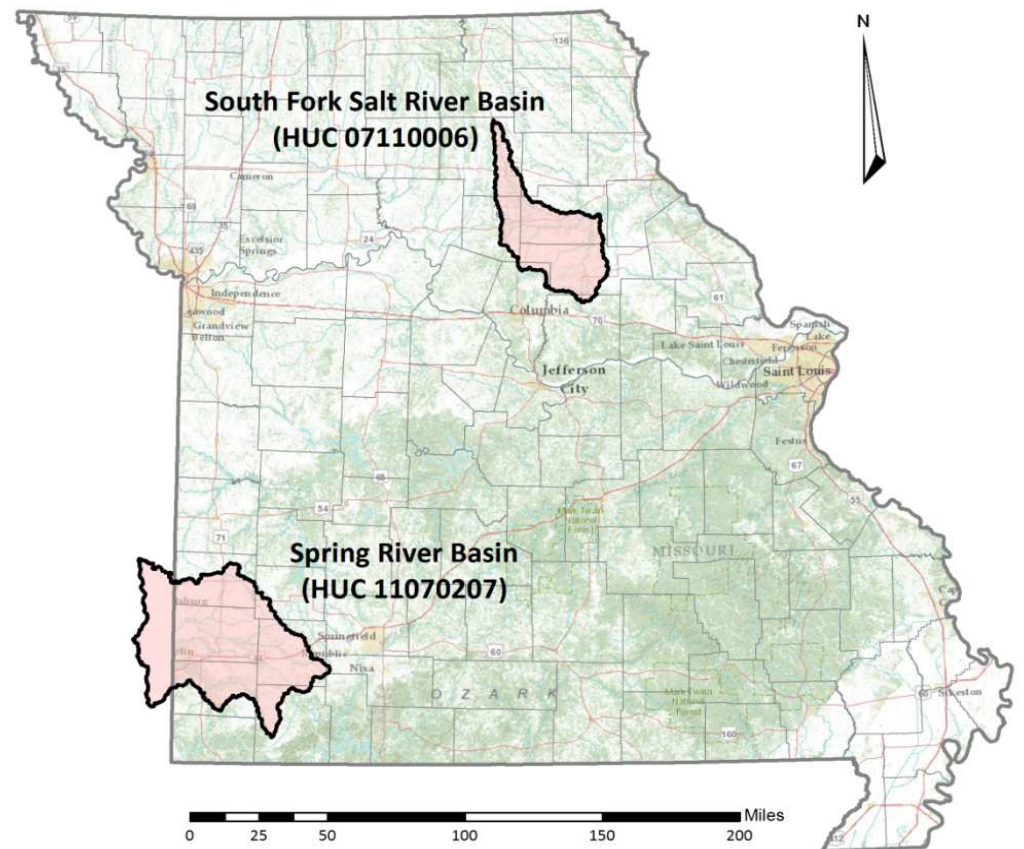
**Required in
the absence
of trading**



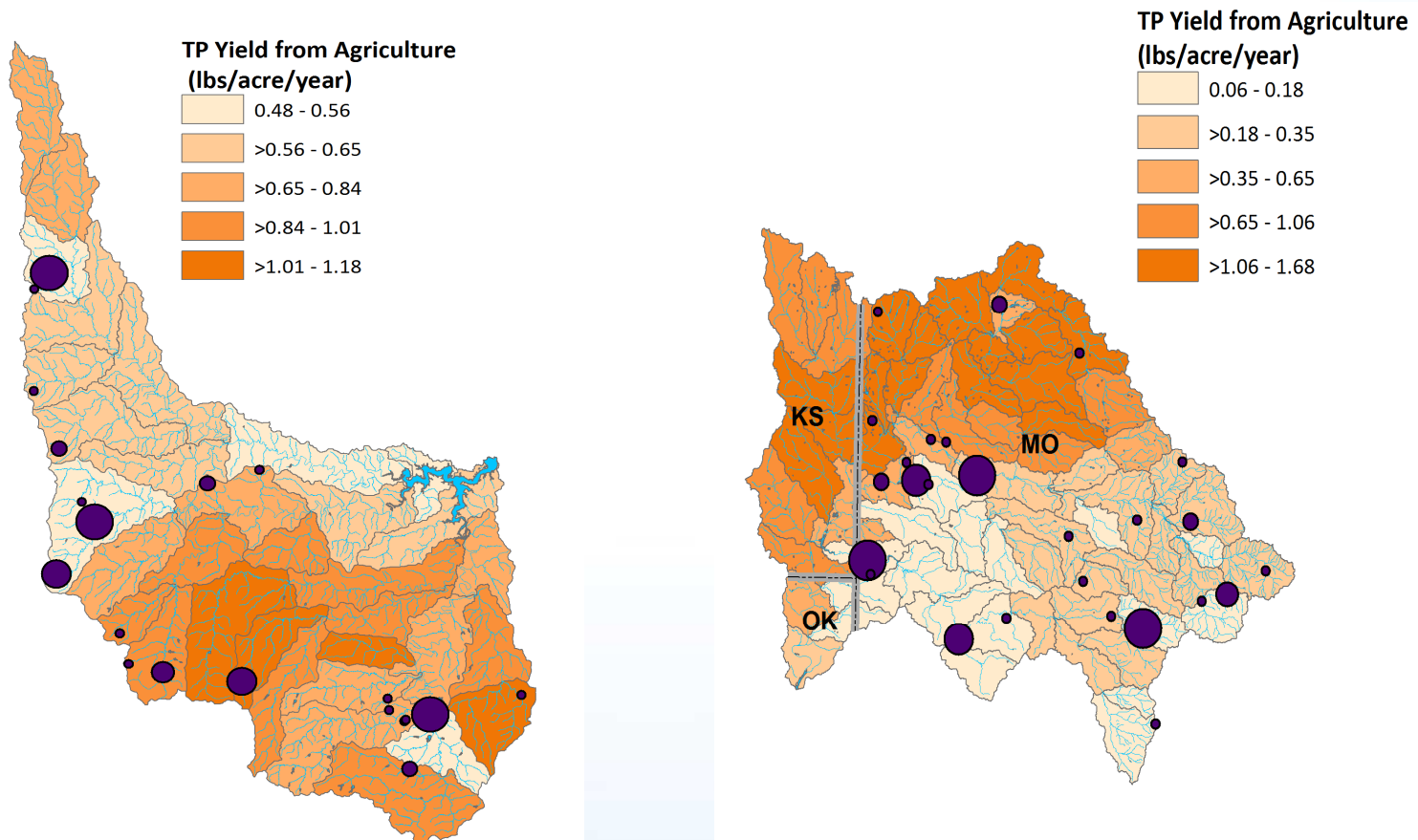
2:1 Trading Ratio

Simulation Approach

- Evaluate PS-NPS and PS-PS trading feasibility in 2 Missouri basins
- How do three factors interact to affect
 - Potential supply
 - Potential demand
 - Overall costs
- Identify important principles for a MO WQT program

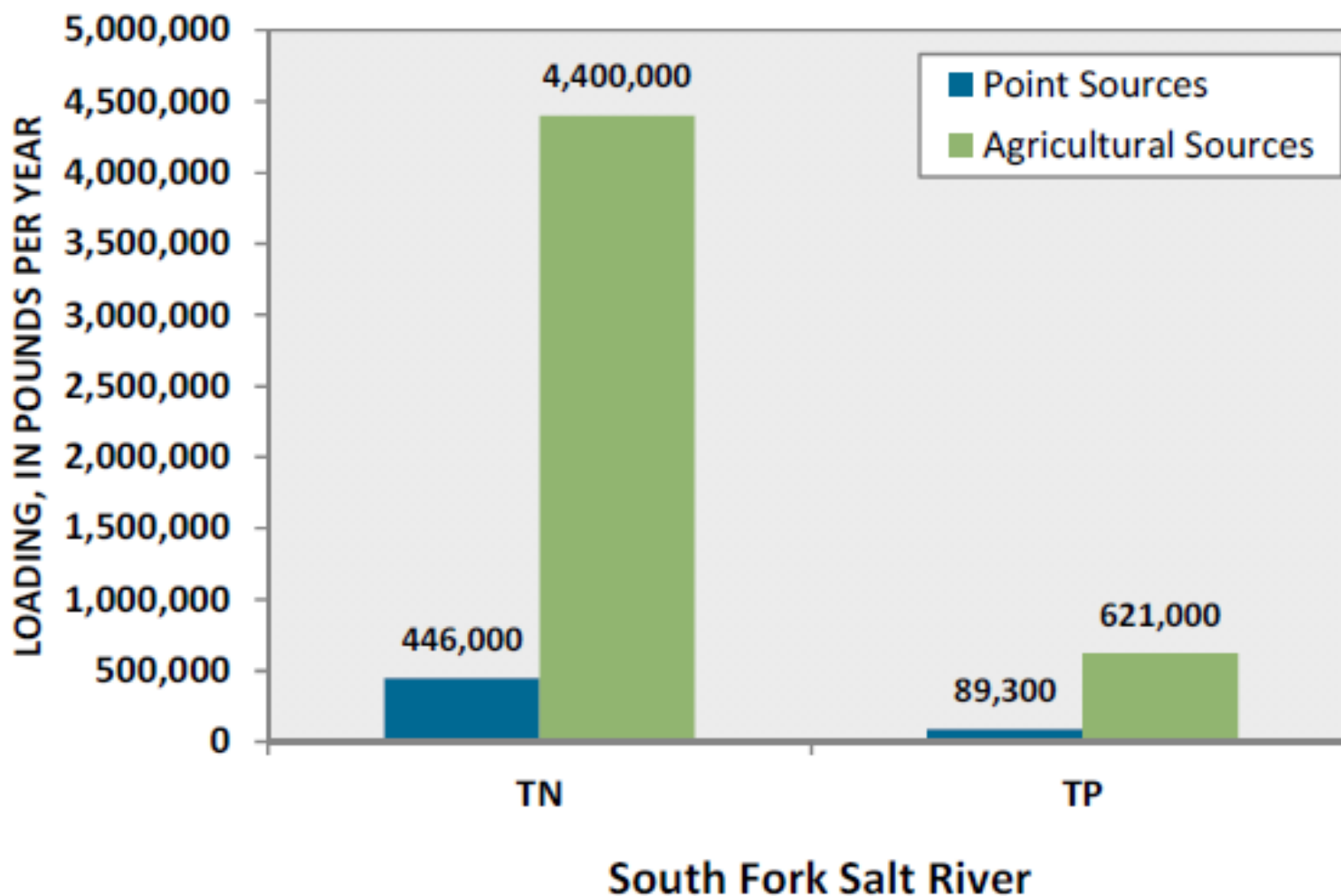


Estimating Existing Loads



- 46 Domestic WWTPs
- 90% of PS Loading from 1/4 of WWTPs

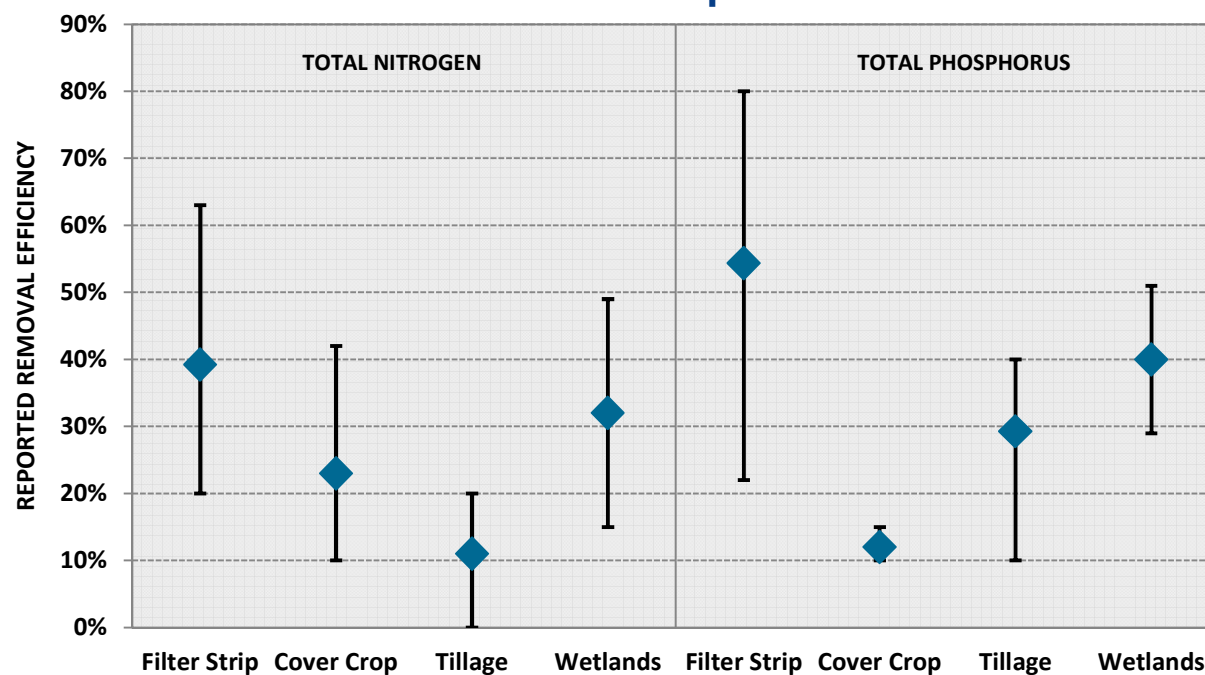
First-Cut Feasibility Evaluation



Estimating Nonpoint Source Credit Supply

- BMP removal efficiencies
- BMP implementation rates
- Producer participation

Potential Range of Nutrient Treatment Efficiencies for Cropland BMPs



BMP Cost Estimates

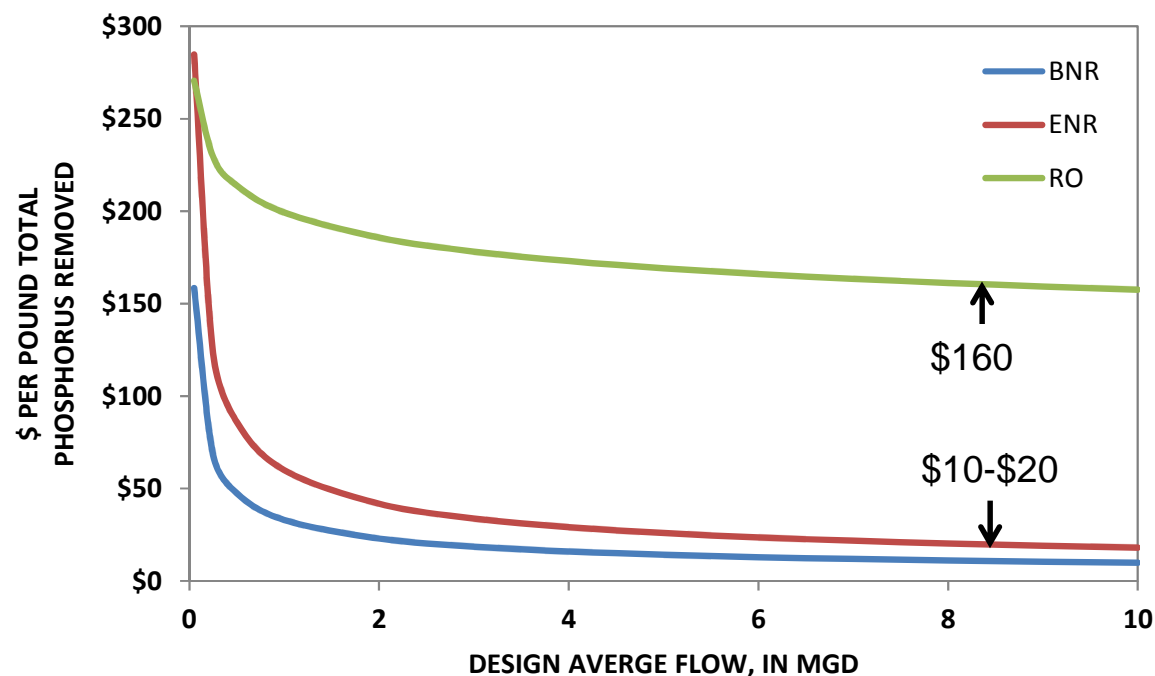
- Implementation Cost Factors
 - Establishment & annual maintenance costs
 - Opportunity costs
 - Useful life

Applicable Land Use	BMP	Annual Cost per Acre Treated	Annual Cost per Pound TN Removed (Salt/Spring)	Annual Cost per Pound TP Removed (Salt/Spring)
Cropland	Filter Strips	\$6	<\$2/<\$2	<\$2/\$4
	Cover Crops	\$65	\$50/\$53	\$158/\$85
	Conservation Tillage	\$65	\$24/\$26	\$389/\$209
	Constructed Wetlands	\$80	\$21/\$23	\$143/\$77
Pasture	<u>Offstream Watering</u> (S. Fk. Salt River)	\$11	\$15	\$181
	<u>Offstream Watering</u> (Spring River)	\$11	\$19	\$181

Estimating Site-Specific Treatment Upgrade Costs

Estimated WWTP Upgrade Costs

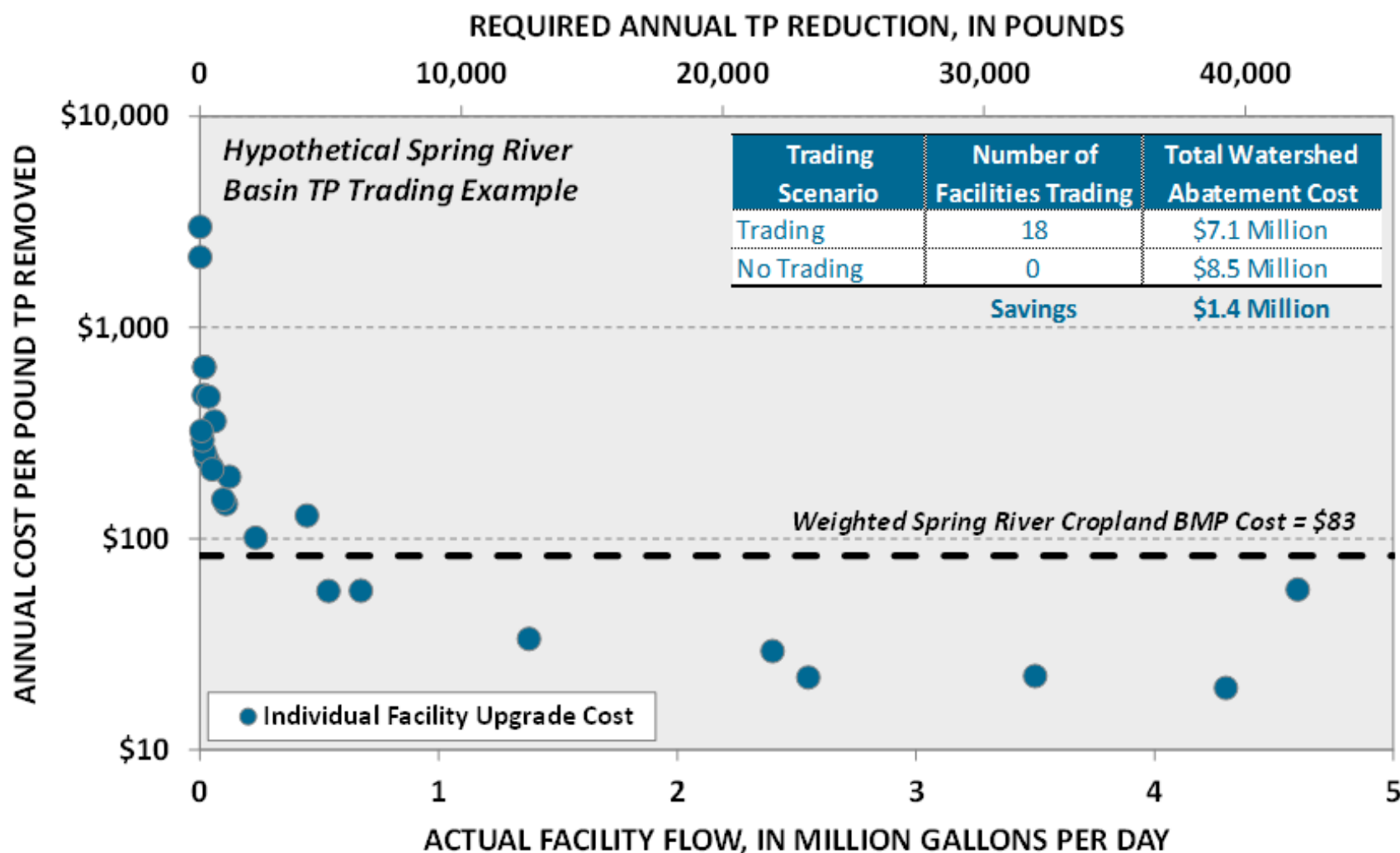
Activated Sludge Facilities



- 46 Facilities
- 3 Baseline Categories
- Flows from < 0.05 to 5 MGD

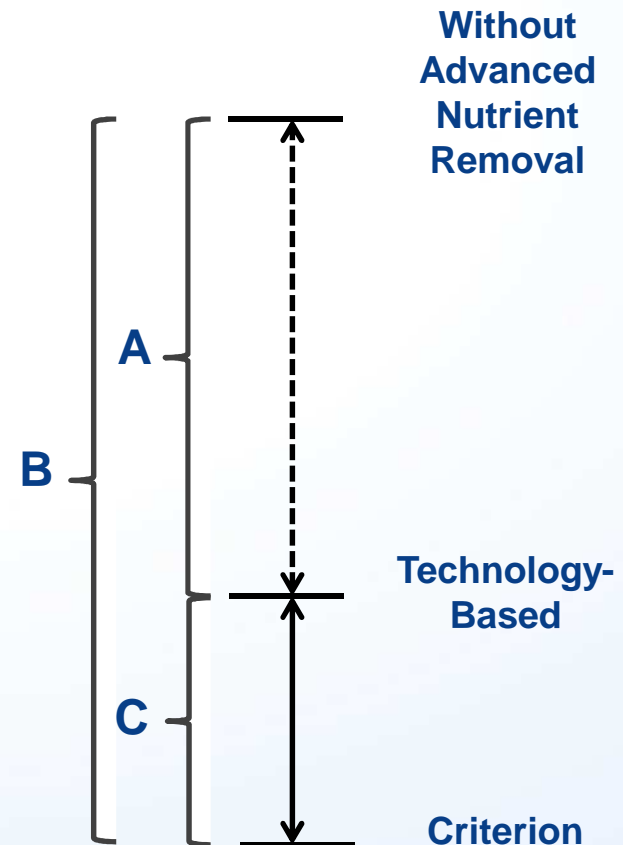
Category	TP (mg/L)	TN (mg/L)
≈ BNR	1	8
≈ ENR	0.5	5
RO	< 0.02	< 1

Interpreting Supply and Demand Estimates



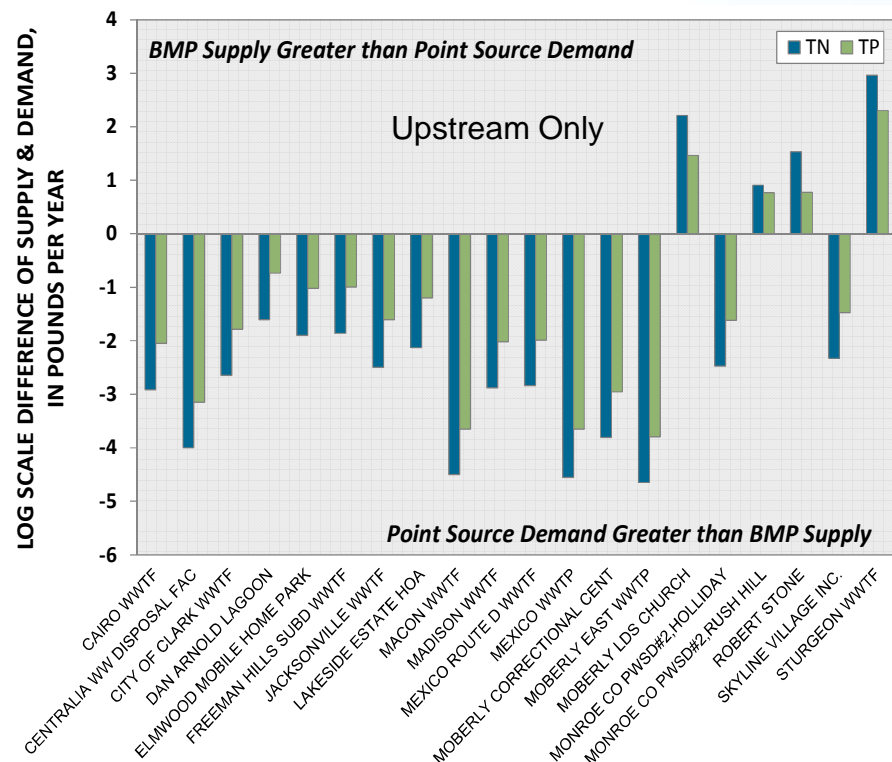
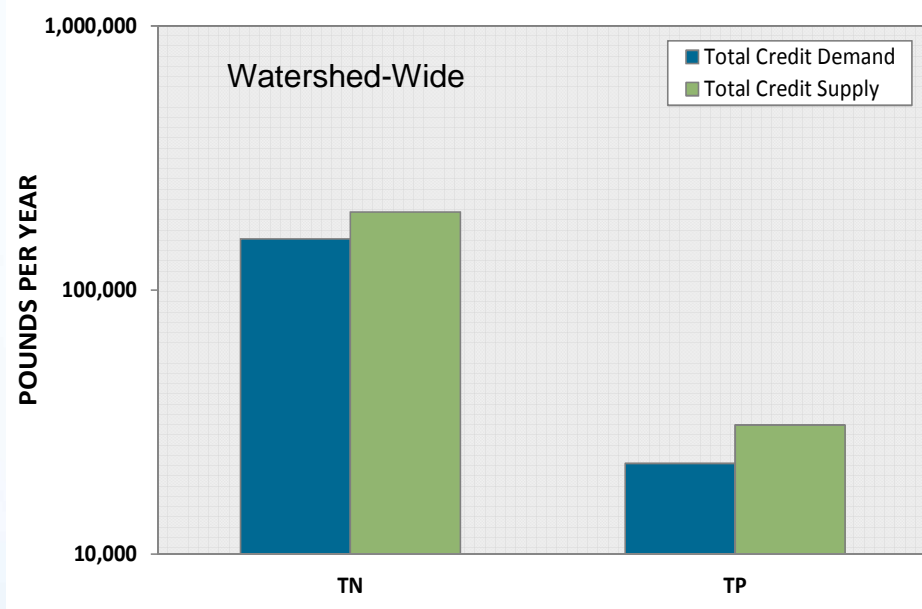
Simulation Results: *Impact of Trading Margin*

- Impacts PS Credit Demand
- A stringent margin is not cost-effective, especially for small WWTPs with high upgrade costs
 - Meet TBEL and trade remainder vs. trading entire margin



Simulation Results: Impact of Trading Area

South Fork Salt River Basin



- Trading Area Impacts NPS Credit Supply
- “Upstream-Only” Limits Trading Opportunities, Many WWTPs Want to Trade but Can’t

Simulation Results: *Impact of Trading Ratios*

- Science-Based Reasons for Including Some Ratios

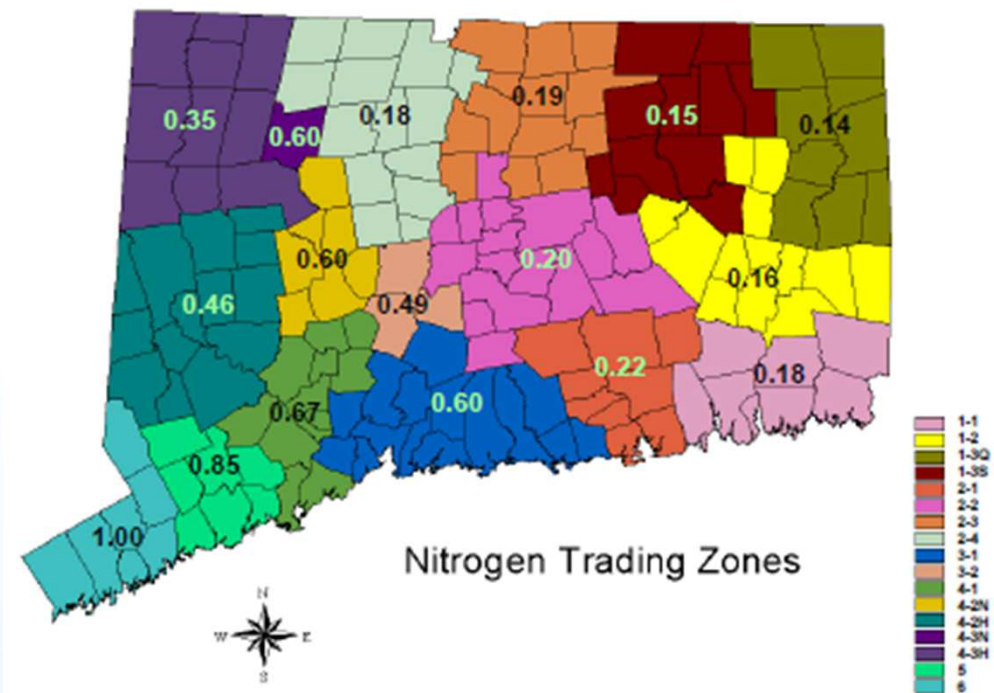
- Delivery/Location
- Uncertainty
- Equivalency

- Others are Less-Clear

- Retirement Ratio

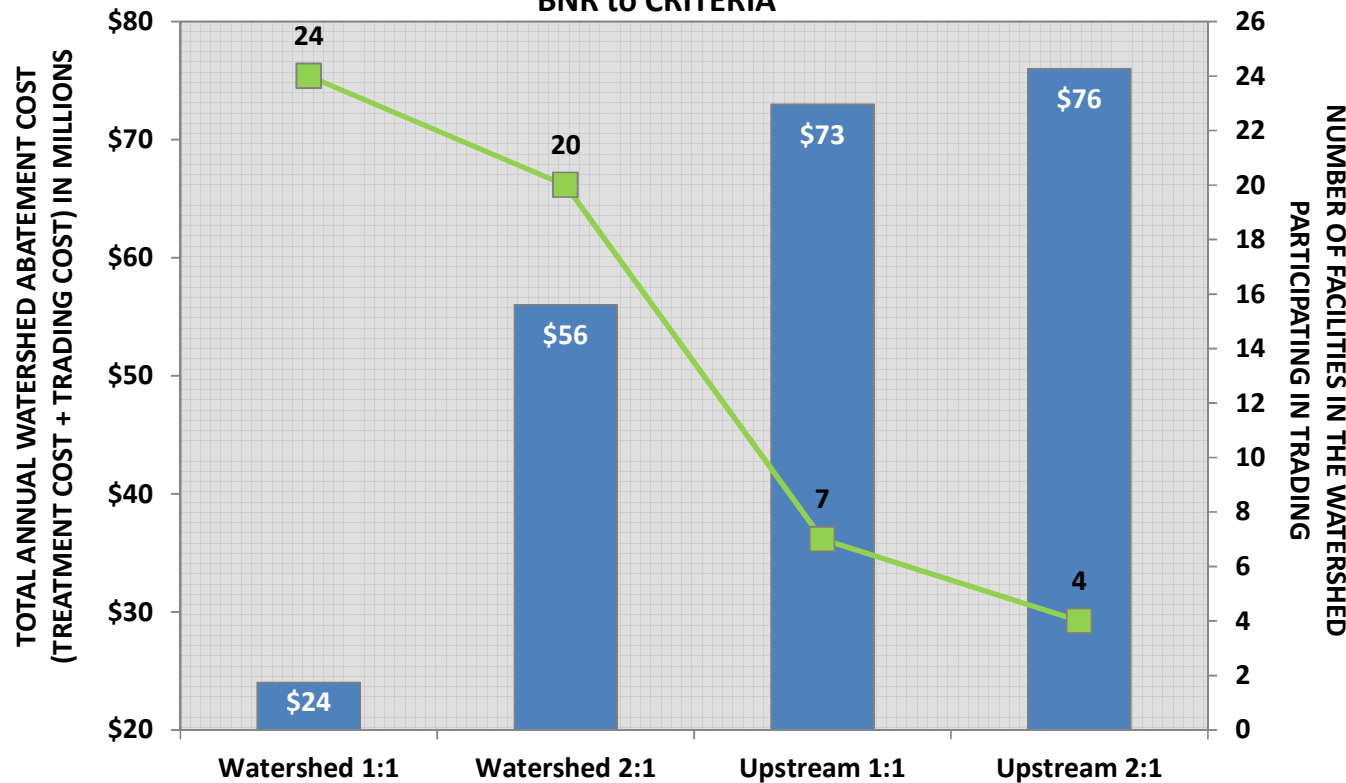
- Ratios Increases Cost of Trading

- Unjustified Ratios Affect Efficiency and Equity



Simulation Results: *Area + Ratio + Margin*

PHOSPHORUS TRADING IN THE SPRING RIVER BASIN
BNR to CRITERIA



For Any Given Margin, Large Trading Areas and Low Trading Ratios Allow the Highest Number of Facilities to Trade

Point to Point Trading Example

Mexico Sells Credits to Smaller WWTPs

- Trading Scenario
 - Pt-NPt trading ratio = 2:1
 - Pt-Pt trading ratio = 1:1
 - Trading area = watershed
 - Trading margin = existing to BNR
- Mexico Treatment Costs
 - BNR = \$5/lb TN
 - ENR = \$9/lb TN
 - Marginal cost = \$24/lb TN

Treatment Facility	Actual Flow (MGD)	Required TN Reduction (lbs/year)	Annual Nonpoint Source Trading Costs		Annual Treatment Costs	
			Total Cost	Cost/lb	Total Cost	Cost/lb
Mexico WWTP	2.6	94,976	\$3,771,889	\$40	\$511,778	\$5
Moberly East WWTP	2.1	76,711	\$3,000,279	\$39	\$551,081	\$7
Macon WWTF	1.5	54,794	\$2,074,346	\$38	\$1,153,854	\$21
Centralia WW Disposal Facility	0.505	18,447	\$549,974	\$30	\$666,844	\$36
Moberly Correction Center	0.307	11,214	\$334,341	\$30	\$386,266	\$34
Sturgeon WWTF	0.1	3,653	\$108,906	\$30	\$287,692	\$79
Cairo WWTF	0.045	1,644	\$49,008	\$30	\$144,957	\$88
Madison WWTF	0.04	1,461	\$43,562	\$30	\$89,856	\$61
Mexico Route D WWTF	0.033	1,205	\$35,939	\$30	\$134,265	\$111
City of Clark WWTF	0.022	804	\$23,959	\$30	\$111,028	\$138
Jacksonville WWTF	0.017	621	\$18,514	\$30	\$84,874	\$137
Monroe Co. PWSD#2, Holliday	0.0143	522	\$15,574	\$30	\$84,874	\$162
Monroe Co. PWSD#2, Rush Hill	0.0121	442	\$13,178	\$30	\$73,927	\$167
Skyline Village Inc.	0.01	365	\$10,891	\$30	\$76,253	\$209
Lakeside Estate HOA	0.00864	316	\$9,409	\$30	\$62,946	\$199
Elmwood Mobile Home Park	0.004	146	\$4,356	\$30	\$43,630	\$299
Freeman Hills Subd WWTF	0.00385	141	\$4,193	\$30	\$53,678	\$382
Dan Arnold Lagoon	0.002	73	\$2,178	\$30	\$39,198	\$537
Robert Stone	0.0015	55	\$1,634	\$30	\$34,143	\$623
Moberly LSD Church	0.00075	27	\$817	\$30	\$3,814	\$139

Treatment Upgrade Parameter	Value
BNR Treatment Cost, in \$/year	\$511,778
ENR Treatment Cost, in \$/year	\$1,082,637
Marginal ENR Cost, in \$/year	\$570,859
BNR TN Reduction, in lbs/year	94,976
ENR TN Reduction, in lbs/year	118,720
Incremental ENR Reduction, in lbs/year	23,744
Marginal Cost for Incremental Credits, in \$/lb	\$24

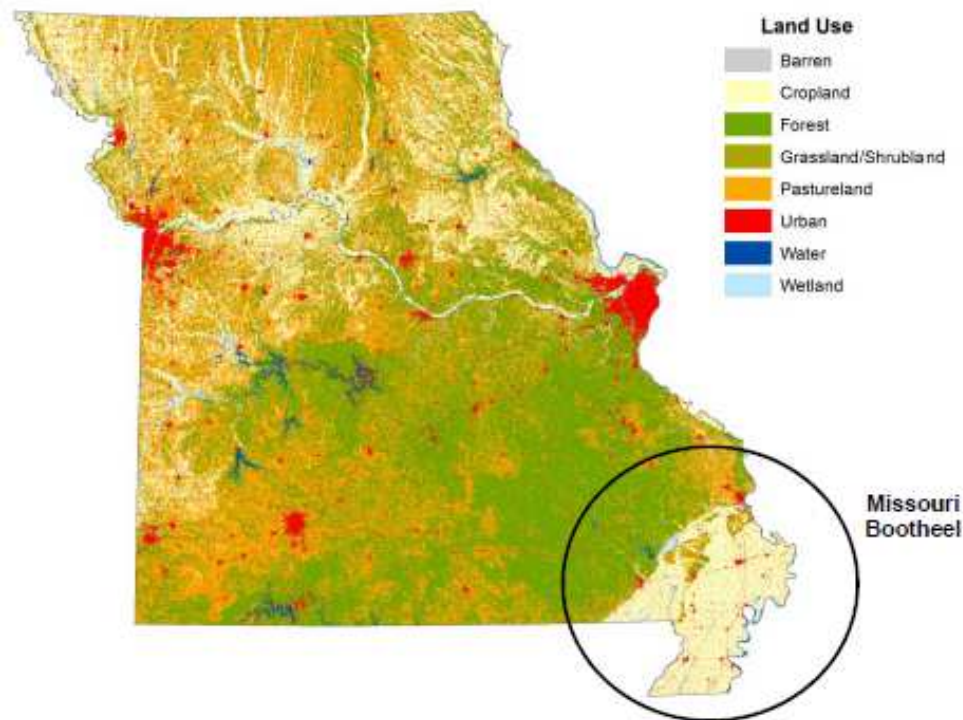
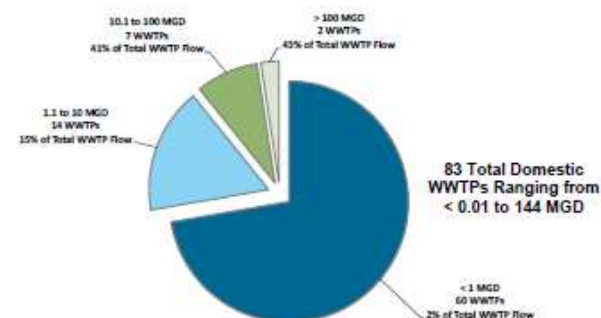
Big River Trading



- Big River Trading Drivers May be Different than Small Streams
- Gulf of Mexico May be the Driver
- Up to 80% of Nutrients are from Agriculture
- Flexibilities to Address Downstream Impacts

Targeted NPS Trading

Nutrient	Existing Treatment to BNR	Existing Treatment to ENR
Total Nitrogen, in lbs/year	4.6 Million	5.3 Million
Total Phosphorus, in lbs/year	18.2 Million	22.9 Million



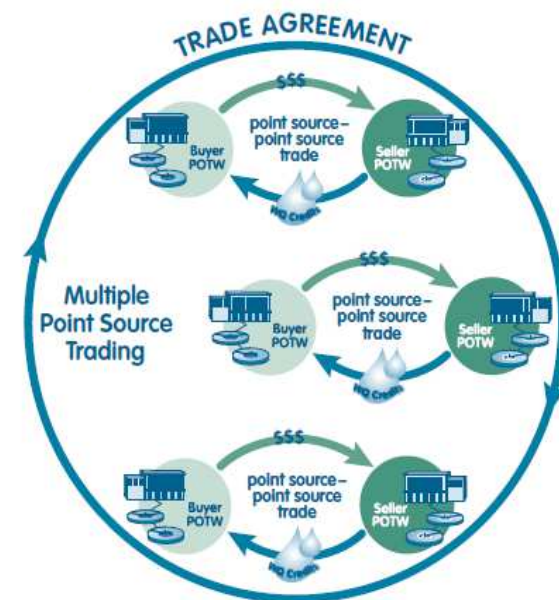
- Nine WWTPs contribute 80% of Load
 - Low Upgrade Costs
- PS Trading Opportunities
- NPS Trading: Large Pool of Low-Cost BMP Credits Needed

Creating a Workable Trading Program

- 1) Trading Areas Should be as Large as Possible
- 2) Only Scientifically-Based Ratios Should be Used
- 3) Point-to-Point Trading is Cost-Effective in Some Situations
- 4) Big River Trading Drivers are Different
- 5) WWTPs Should be Free to Set the Top of the Margin
- 6) Administrative and Transaction Costs May Limit Trading
- 7) Liability, Monitoring, and Enforcement Require Special Consideration
- 8) Baselines Increase Trading Costs

Neuse River

- Nitrogen TMDL driven
- 19 members in bubble permit
 - Voluntary participation
 - Individual NPDES limit is waived
- Informal trading between partners
- Offset payments (\$11/lb) ecological enhancement program
 - No violations to date/never used
- Internal enforcement policy
 - Fines (80% escrow)
 - Funds monitoring and capital improvement grants
- Flexibility – free to choose control strategies



EPRI Ohio River Basin Trading Project

- Working with Ohio, Indiana, and Kentucky
- Testing to determine if trading is economically and socially viable
- “Stewardship” credits – not for NPDES compliance

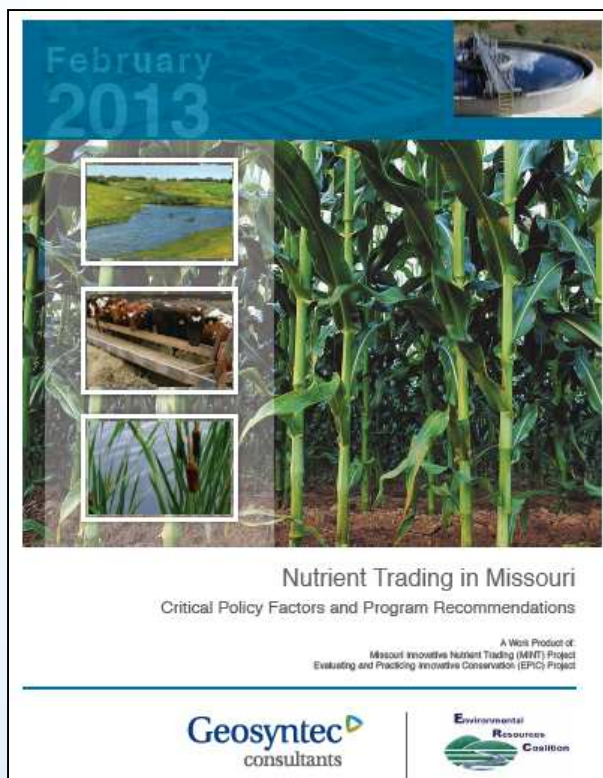
Ohio River Basin Water Quality Trading Project - by the Numbers	
Number of credits (pounds) sold to date:	9,000
Number of farmers funded:	32
Pounds of Total Nitrogen Contracted:	98,314
Pounds of Total Phosphorous Contracted:	28,699
Acres of land under seasonal practices:	516.2
Credits available in May 2015 Auction:	~100,000

Virginia Nutrient Credit Exchange Program

- **Authorized by Governor in 2005**
- **Existing** - acquire credits from other point sources
- **New or Expanding** must offset from:
 - One or more permitted facilities in the same tributary
 - Acquisition of NPS load allocations through the use of BMPs (2:1 ratio)
 - Water Quality Improvement Fund
- **Water Quality Improvement Fund**
 - Provides technical and financial assistance made available through grants provided from the fund
 - Project eligibility is limited to design and installation of nutrient reduction technology at Chesapeake Bay POTWs



Download the Report : http://www.mocorn.org/wp-content/uploads/2012/09/CIG_Nutrient-Trading-in-Missouri_Feb2013.pdf



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